UNIVERSITY OF WISCONSIN - MILWAUKEE
HELEN BADER SCHOOL OF SOCIAL WELFARE,
Introduction to Statistical Methods (SW 961, Sec 401)

Term: Spring, 2008 (9/2/08 - 12/11/08)
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Time and location: Mondays, 1:00pm - 3:45pm, Curtin Hall Rm 181.

Course Description

Social science research frequently relies on quantitative methods as an aid in interpreting research findings. For this reason, it is important that students develop a thorough understanding of these methods. SW 961 provides an overview of many statistical procedures commonly used in the social sciences and is intended to serve as a foundation for more advanced study. The course is designed to review and introduce parametric and nonparametric approaches to analyzing univariate and bivariate data. Students who have had little exposure to statistics coursework will be helped to move quickly to an intermediate level, in preparation for more advanced coursework. This course, or satisfactory completion of its equivalent or demonstration of equivalency, is required of all students in the social work doctoral program.

This one-semester graduate level course is divided into two parts: a lecture section and computing lab. The lecture portion will cover concepts and applications, as well as provide practice in the interpretation and calculation of the various statistics. Lab time will be used to show how the analyses are conducted in the SAS and SPSS statistical software packages and how to interpret the output.

Prerequisites

Graduate standing or the written consent of the instructors.

Course Objectives

On completion of this course, the students will be able to:

1. Choose appropriate statistical procedures to address research questions.
2. Critically assess the application of statistical techniques reported in published research.
3. Perform statistical analyses by hand calculation and using computer software.
4. Properly interpret statistical software output.

Texts / Readings

Lecture texts:

- Stevens, J. P. (2007). Intermediate Statistics (3rd Edition). Lawrence Erlbaum Assoc., New York, NY.
- Hollander, M. & Wolfe, D. A. (1999). Nonparametric Statistical Methods (2nd. Edition). John Wiley & Sons, Inc.: New York, NY.

Lecture notes:

- Copies of the lecture notes and other class materials will be available on the D2L system and can be printed out prior to lecture to facilitate note taking.

Course Policies

Campus policy information regarding participation by students with disabilities, accommodations for religious observances, academic conduct/misconduct, incomplete grading policies, complaint procedures, grade appeal procedures, sexual harassment and safety policies, final exam date requirements, and other standing policies/procedures is available on-line at: http:www.uwm.edu/Dept/SecU/SyllabusLinks.pdf.

Academic Misconduct: Academic misconduct is an act in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts.

Prohibited conduct includes cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.

Students' work must be in their own words except where appropriately cited. Excerpts from other authors may be used judiciously, but direct quotes involving even a few words must include the source, date, and page number(s) and must be indented or enclosed in quotations. Failure to comply with these requirements constitutes plagiarism and is grounds for a failing grade.

Late assignments and make-up policy: Students are expected to be present for examinations and *to turn in assignments on or before the due date* unless they contact the instructor in advance of the exam or due date. If an extension is given for a particular assignment, the grade may be reduced at the discretion of the instructor. Alternatives such as make-up exams or substitute assignments may then be made available at the instructor's discretion, but these will only be offered as a result of circumstances beyond the student's control. Failure to comply with the above requirements will result in a grade of zero for the relevant assignment.

Attendance and class participation: Because the material will be covered at a rapid pace, attendance is mandatory for all lectures and labs unless prior arrangements have been made with the instructor. Students with *unexcused absences* will receive a one-third reduction in their final grade for each unexcused absence (e.g., a final grade of A will be reduced to an A- following one absence).

Participation by Students with Disabilities: If you need special accommodations in order to meet any of the requirements of this course, please contact me and the Student Accessibility Center as soon as possible to make the necessary arrangements.

Accommodation for Religious Observances: Students will be allowed to complete examinations or other requirements in advance of a religious observance.

Assignments/Grading

Weekly assignments: Students will be assigned weekly homework problems for the lecture portion of the course. Each assignment will be worth 20 points and together will count for 30% of your total grade.

Exams: Three (3) exams covering the lecture material will be given over the course of the semester. Exams 1-2 will each count 20% and the ***final exam*** 30% toward your final grade; exams count for a total of 70% of your final grade.

Determination of Student Grade

Letter grades will not be assigned on individual assignments or exams. Rather, each assignment and exam will be allotted a specific number of points. Points earned will be summed into a final point total and letter grades assigned based on these final point totals by the percents listed below.

94 – 100% = A	80 – 82% = B-	67 – 69% = D+
90 – 93% = A-	77 – 79% = C+	63 – 66% = D
87 – 89% = B+	73 – 76% = C	60 – 62% = D-
83 – 86% = B	70 – 72% = C-	0 – 59% = F

Topics

Week 1: Introduction and overview, begin basic stats review

Readings: Chapter 1- Stevens
Relevant chapters in any undergraduate level statistics text.

1. Introduction and overview of course. Review syllabus.
2. Overview of basic concepts, populations, samples, etc.
3. Frequency distributions
4. The normal distribution; z-scores; the unit normal table; finding percentile ranks, estimating proportions, finding scores from percentiles.
5. Measures of central tendency: unweighted and weighted means, median, mode, harmonic mean, geometric mean, quadratic mean.
6. Measures of dispersion or variability: Sum of Squares, variance, standard deviation (sample and population estimate), range, semi-interquartile range, interquartile range.
7. Graphing: bar charts, histograms, line graphs, box plots, stem and leaf plots, scatter plots, etc.

HW #1

Week 2: Correlation.

Readings: Relevant chapters in any undergraduate level statistics text.

1. Overview of correlation concepts and the general formula for Pearson's r
2. Interpretation of and understanding the meaning of the correlation coefficient - z-score formula, range, direction, magnitude
3. Members of the Pearson family of correlation coefficients, their application, and extensions: biserial, point-biserial, tetrachoric, polychoric, polyserial, Spearman's rho, Phi, etc.
4. Other indices of association: Tau, Gamma, etc.
5. Coefficient of determination

HW #2

Week 3: Basics of Inferential Statistics

Readings: Chapter 1- Stevens
Relevant chapters in any undergraduate level statistics text.

1. Probability
2. Overview of hypothesis testing:
   - Population, sample, and sampling distributions
   - Constructing an empirical sampling distribution - resampling methods
   - Central limit theorem
   - 4-step procedure for hypothesis testing
3. Introduction to the concept of power and effect sizes
4. One sample z-test

HW #3

Week 4: Basics of Inferential Statistics cont.

Readings: Chapter 1 - Stevens
Relevant chapters in any undergraduate level statistics text.

1. One sample t-test, t-table
2. Independent and related samples t-tests
3. Robust significance testing using Winsorized and trimmed means
4. Fisher's z-transformation and testing the difference between two correlation coefficients, significance tests for other correlation coefficients
5. Methods for calculating power, effect sizes, and sample sizes for the t-test and correlation coefficients; corrected standard error for correlations with small samples
6. Confidence intervals - rationale, methods of construction and interpretation

HW #4
Exam I – DUE 10-06-08

Weeks 5-9: Analysis of Variance

Readings: Chapters 2,3 - Stevens

1. ANOVA Introduction and overview, assumptions of the ANOVA model

2. Completely Randomized Design (One-way Analysis of Variance; ANOVA)
   - Design model
   - Expected Mean Squares
     - Fixed vs. random effects
   - F-tests
     - Type I error rate
   - Normalizing transformations
   - Preplanned vs. post hoc tests
   - Multiple comparison tests
   - Trend analysis
   - eta-squared, rho and omega^2
   - Power and sample size estimation

HW #5

Readings: Chapter 4 - Stevens

3. 2-way Completely Randomized Factorial Design
    - Design model
    - Expected Mean Squares
    - F-tests
    - Multiple comparison tests
    - Understanding interactions
        - Simple main effects
        - Contrast x contrast interaction effects
        - Graphing interactions
    - eta-squared, rho and omega^2
    - Power and sample size estimation

HW #6

Readings: Chapter 5 - Stevens

4. Randomized blocks design (One-way repeated measures ANOVA)
    - Design model
    - Expected Mean Squares
    - F-tests
    - Multiple comparison tests
    - Understanding interactions
        - Simple main effects
        - Contrast x contrast interaction effects
        - Graphing interactions
    - eta-squared, rho and omega^2
    - Power and sample size estimation
    - General Randomized blocks design

Readings: Chapter 5 - Stevens

5. Split-plot Design
    - Design model
    - Expected Mean Squares
    - F-tests
    - Multiple comparison tests
    - Understanding interactions
        - Simple main effects
        - Contrast x contrast interaction effects
        - Graphing interactions
    - eta-squared, rho and omega^2
    - Power and sample size estimation

HW #7

Exam II

Weeks 10-13: Nonparametric Statistics (readings in Hollander & Wolfe unless specified otherwise)

1. Overview of nonparametric statistics: Chap 1

2. "Goodness-of-fit" tests
    - Binomial test: pp 20-28

Chi-Square Goodness-of-Fit test: Handout
Kolmogorov-Smirnov One- and Two-sample tests: pp 178-185

3. Tests for related samples:
   McNemar: pp 468-473
   Sign test: Handout
   Wilcoxon Signed Ranks Test: pp36-51, 79-81
   Friedman's test: Handout

HW #8

4. Tests for independent samples
   Fisher Exact Test: 473-475
   Chi-square test for equiprobability and for independence: pp 461-471
   Kruskal-Wallis: pp 189-199
   Wilcoxon-Mann-Whitney test: pp 106-123, 132-134

HW #9

5. Stratification tests
   Cochran, Mantel, Haenszel: pp 484-492
      Odds and odds ratios

6. Randomization tests (Permutation tests): Handout

7. Note on power-efficiency of nonparamteric tests: Notes

HW #10

Week 14: Missing Data and Preparing Data for Analysis

Readings: Handouts on D2L

1. Overview of missing data mechanisms and techniques for handling missing data
   MCAR, MAR, NMAR and OAR
   Hot-deck imputation
   Cold-deck imputation
   Mean imputation
   Regression-based methods
   Multiple imputation
   The EM algorithm

Exam III

Some Web-based resources:

- SAS: www.sas.com
- SPSS: www.spss.com
- An excellent site with information on SPSS: www.spsstools.net
- UCLA Statistical computing site: http://www.ats.ucla.edu/stat/
- Karl Wuensch's Web page with information on SAS and SPSS: http://core.ecu.edu/psyc/wuenschk/SAS.htm
- Practical Stats -- http://www.psych.ku.edu/preacher/